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MUD SHRIMPS OF THE ATLANTIC
COAST OF NORTH AMERICA

(WITH FOUR PLATES)

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Except for the comprehensive and invaluable papers of de Man,¹ and the exceedingly useful, though less exhaustive, account of Borradaile,² there is for American workers no readily available taxonomic information concerning the several species of *Callianassa* occurring on the Atlantic coast of North America. To fill this need in part at least, these brief notes and diagnostic key have been compiled. To render them as complete as possible at this time, it has been found necessary to describe three new species, together with a new variety of one of them, and to propose a new name for a specimen that had been assigned to an old, inadequately described species, which to this day has not been certainly rediscovered:

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It is possible also to report a new record of occurrence in Jamaica for *Callianassa (Callichirus) longiventris*, a species not heretofore seen since the original types were described by A. Milne-Edwards from Martinique.

Moreover, in the light of the studies contributory to this paper, Stimpson's genus *Glypturus* appears no longer tenable, and its unique species therefore reverts to the genus *Callianassa*.

¹ A contribution to the knowledge of twenty-two species and three varieties of the genus *Callianassa* Leach. *Capita Zoologica*, vol. 2, pt. 6, pp. 1-56, pls. 1-12, 1928.

The *Thalassinidae* and *Callianassidae* collected by the Siboga-Expedition with some remarks on the *Laomedidae*. *Siboga-Exped. Monogr.* 39a^o, pp. 1-187, pls. 1-20, 1928.

² On the classification of the *Thalassinidea*. *Ann. Mag. Nat. Hist.*, ser. 7, vol. 12, pp. 534-551, 1903.

A word of appreciation is here extended to some of the students and staff of the Biological Laboratory of the Louisiana State University at Grand Isle, La.; in particular, Dr. Ellinor H. Behre, Director, and William W. Anderson, a student of several summers ago, whose industry first brought to my attention specimens of two undescribed species found at Grand Isle, in the determination of which the other information here presented was brought together. I also wish to thank, among others, Drs. E. A. Andrews, of Johns Hopkins University; C. B. Wilson, of the State Teachers College at Westfield, Mass.; and A. S. Pearse, of Duke University, Durham, N. C. who have contributed specimens of Callianassas to the collections of the United States National Museum.

Three west Atlantic species are not included in the key given below:

(1.) *Callianassa grandimana* Gibbes (Proc. 3d. Meet. Amer. Assoc. Adv. Sci., p. 194, 1850. Type locality, Key West). Many attempts have been made to establish this species, regrettably so briefly described by its author. The species to which it seems to stand nearest is *C. branneri* (Rathbun). Of this latter species I have the greater part of several large specimens taken by Dr. A. S. Pearse on Long Key, Dry Tortugas, Fla., out in the Gulf of Mexico, roughly 60 miles due west of Key West, the type locality of *C. grandimana*, but until we know more of the Callianassas of our southern States we should refrain from making use of Gibbes' specific name. Balss some time ago assigned a specimen from Kingston, Jamaica, to *C. grandimana*, but the very spiny armature of the ventral border of the ischium and merus of the larger cheliped of this specimen definitely precludes any such identity. The ischium of *C. grandimana*, second segment of Gibbes,³ has "distant granules on its lower edge," and the merus, "the third segment [,] is broader, dilated so as to form below a sharp serrated edge, which is truncated as it approaches the posterior articulation." Balss' specimen, moreover, shows a prominently trispinose front; Gibbes says nothing on this score, but I do believe if the front had been different in any marked degree from that of *C. major* he would have made some comment to that effect; his observations, so far as they have been checked, have always been proved accurate. His fault was brevity of descrip-

³ De Man, *Capita Zoologica*, vol. 2, pt. 6, p. 19, 1928, does say that Gibbes did not describe the merus and ischium, but in the very relations of the several joints of the major cheliped as set forth by Gibbes, the second and third joints are none other than those particular joints; the shape ascribed by him to each of them makes their identification unmistakable.

tion. Just recently his *Squilla neglecta*, characterized in remarkably few words, has been found again and recognized without difficulty.⁴ The front of his *grandimana* surely cannot be very different from that of *C. major* or very unlike that of *C. branneri*. That several authors have assumed that *C. grandimana* had a trispinose front seems to be due to a mistaken impression based on Stimpson's passing comparison of the description, not specimens, of Gibbes' species with his *Glypturus acanthochirus*. De Man was well aware that Stimpson, as he says, had never seen the Gibbes species, yet he, too, without any good reason, was moved to consider that it might be related to the trispinose *C. longiventris*. For Balss' species the name of the collector, Dr. R. Hartmeyer, is proposed: *Callianassa hartmeyeri*.

(2.) *Callianassa siguanensis* (Boone). (*Glypturus siguanensis*, Bull. Bingham Oceanogr. Coll., vol. 1, art. 2, p. 85, fig. 17, 1927. Type locality, Sigüanea Bay, Isle of Pines.) This species would key out below with *C. branneri* (p. 4, below). For want of evidence other than that given by the author I am inclined to consider it identical with this last-named species.

(3.) *Callianassa occidentalis* Bate (Rept. Challenger Macrura, p. 29, pl. 2, fig. 2k, 1888. Type locality, off Sombrero Island). Only the larger left cheliped is known, so the species (?) cannot be satisfactorily keyed out; moreover, it may even be the cheliped of a larger specimen of the "*Cheramus*" *occidentalis* of the same author noted in the key below (II. A., p. 5), a considerably mutilated specimen lacking the chelipeds.

KEY TO SPECIES OF CALLIANASSA

- I. Telson broader than long, third maxillipeds more or less broad and flattened, especially ischium and merus, and often the propodus too.
 - A. Lateral angles or projections of front not spined.
 - 1. Inner uropods narrow, about four times as long as broad, styliform or straplike; rostral projection low, blunt, or rounded triangular.
 - a. Carpus of larger cheliped more than four times as long as its greatest width; merus with a shallow projection or low granulated tooth on ventral border; ischium with a long, prominent hooked tooth or spine near middle of ventral border. . . . *islagrande*, n. sp.
 - b. Carpus less than three times as long as wide; merus with strong tooth near proximal end of lower border; ischium not known (North Carolina to Florida) *major* Say.⁵

⁴Lunz, G. Robert, Jr., Charleston [S. C.] Museum, Leaflet No. 5, pp. 1-8, 1933.

⁵Journ. Acad. Nat. Sci. Philadelphia, vol. 1, pt. 2, p. 238, 1818; de Man, Capita Zoologica, vol. 2, pt. 6, p. 30; pl. 7, fig. 14-14b; pl. 8, fig. 14c-14d, 1928.

2. Inner uropods wider, either (a) about twice as long as wide or (b) not much longer than wide.
 - a. Inner uropods about twice as long as greatest width; rostrum a conical acuminate spine.
 - i. Merus of larger cheliped armed with a toothlike process near proximal end of ventral border; upper border of carpus about as long or longer than upper border of palm. *jamaicensis*, n. sp.
 - ii. Merus unarmed below; upper border of carpus not exceeding three-fourths the length of upper palmar border (Puerto Rico and Barbados) *marginata* Rathbun.⁶
 - b. Inner uropods not much longer than wide; rostrum low, triangular, subacute, or rounded off.
 - i. Merus of larger cheliped armed with a strong tooth near proximal end of lower border; upper border of carpus three-fourths or more the length of the upper palmar border (Massachusetts to North Carolina) *atlantica* Rathbun.⁷
 - ii. Merus inconspicuously serrate or denticulate, but without strong tooth below; carpus from a half to two-thirds as long as upper border of palm (Brazil, Bermuda, Puerto Rico, Barbados, and the Dry Tortugas, Florida) *branneri* Rathbun.⁸
- B. Frontal margin trispinose.
 1. Both chelae armed with three strong spines above; upper border of carpus three-fourths the length of the palmar border; carpus strongly spined on lower border, merus spined above and below (Florida, Jamaica, Barbados) *acanthochirus* Stimpson.⁹
 2. Chelae not armed with strong spines above.
 - a. Eyestalks flattened, cornea on dorsal surface; merus of larger cheliped multidenticulate below, of minor cheliped unarmed; upper border of carpus of larger cheliped less than half the length of the upper palmar border *rathbunae*, n. sp.
 - b. Eyestalks subcylindrical, cornea terminal or nearly so.
 - i. Merus of large cheliped with more than five spines on ventral border, of minor cheliped unarmed; upper border of major carpus less than half as long as upper palmar border (Martinique and Jamaica) *longiventris* A. M.-Edw.¹⁰
 - ii. Merus of large cheliped with four or less spines below, of minor cheliped with one or two; upper border of major carpus more than half the length of the upper palmar border (Jamaica).
hartmeyerii, new name.¹¹

⁶ Bull. U. S. Fish Comm. for 1900, p. 92, fig. 15a-d, 1901.

⁷ U. S. Nat. Mus. Bull. 138, p. 107, footnote, 1926; *C. stimpsoni* Smith, Rep. U. S. Fish Comm. for 187, p. 549, pl. 2, fig. 8, 1873; de Man, Capita Zoologica, vol. 2, pt. 6, p. 37, pl. 9, figs. 17, 17d, 1928.

⁸ Proc. Washington Acad. Sci., vol. 2, p. 150, pl. 8, figs. 5-8, 1900.

⁹ *Glypturus a.*, Ann. Lyceum Nat. Hist. New York, vol. 10, nos. 4, 5, p. 121, 1871.

¹⁰ Nouv. Arch. Mus. Mem., vol. 6, p. 92, 1870. De Man, Capita Zoologica, vol. 2, pt. 6, p. 24, pl. 6, figs. 12, 12h, 1928.

¹¹ *Glypturus grandimanus* Balss, Zool. Anz., vol. 61, p. 179, 1924.

- II. Telson longer than broad; third maxillipeds narrow; frontal margin without lateral spines; eyestalks flattened, cornea dorsal or lateral; inner uropods less than twice as long as wide.
- A. Telson with a pair of spines on the posterior half of either lateral margin, and a spine at middle of posterior margin; rostrum a little shorter than the eyestalks; chelipeds and external maxillipeds unknown (off Sombrero Island)*batei* Borradaile.¹²
- B. Telson laterally with several spinules, posteriorly unarmed; upper border of carpus less than half as long as upper palmar border; rostrum longer than eyestalks; external maxillipeds narrow (Puerto Rico).
minima Rathbun.¹³

CALLIANASSA (CALLICHRUS) ISLAGRANDE, n. sp.

A distinctive species. Lineae thalassinicae distinct; cervical groove crosses the carapace at nearly one-fourth the length of the carapace from the hinder margin. Rostral projection of front low triangular, extending forward beyond the level of the blunt, inconspicuous lateral projections by about one-fourth or one-fifth its width measured between those projections; the rostrum reaches forward less than one-third the length of the eyestalks, and these in turn reach between one-fourth to one-third the length of the second segment of the antennular peduncle.

The eyestalks are dark brown, with black corneae, and are about twice as long as broad; their terminal one-third to two-fifths are each drawn out into a slender spine slightly curved upward, and with the tip very slightly exerted; inner borders of eyestalks contiguous to about the level of the anterior margins of the corneae; the latter are opposite the distal end of the second segment of the antennal peduncle. Fourth segment of the antennal and second segment of the antennular peduncles reach about equally far forward; fifth or terminal segment of antennal peduncle reaches about two-fifths the length of the distal segment of the antennular peduncle.

Right cheliped of male much the larger; remarkably long and slender, quite the most striking character of this species; the carpus exceeds a little the propodus plus the dactyl, even when the latter is extended straight forward; carpus and palm about equally wide; carpus nearly four and one-half times as long as its greatest width; palm shorter, measured on the upper margin, about three and one-half times

¹² Ann. Mag. Hist., ser. 7, vol. 12, p. 546, 1903. *Cheramus occidentalis* Bate, Rept. Challenger Macrura, p. 32, pl. 2, fig. 1, 1888. *Callianassa batei* de Man, Capita Zoologica, vol. 2, pt. 6, p. 10, pl. 1, fig. 3, 1928.

¹³ Bull. U. S. Fish Comm. for 1900, p. 92, fig. 16a-d, 1901.

as long as wide; merus about four-sevenths the length of carpus; ischium a little longer than merus and about two-thirds the length of carpus.

Ischium granulated with low, rounded, "pearly" granules on both faces, more sparsely on outer than inner faces, forming a denticulated inferior margin; upper margin evenly concave, longitudinally deeply grooved; upper part of outer face of joint, including outer ridge, forming dorsal groove without granules, smooth and shining; inner face of ischium more heavily granulated than outer; just before the middle of its length there is a long, prominent, well-granulated tooth on the lower margin of the ischium, a tooth about as long as the ischium is wide.

Upper margin of merus unevenly and shallowly concave in lateral view; at about the posterior third of its ventral margin is a low granulated tooth, appearing to be made up of sharper, more prominent and more crowded granules than those ornamenting the sides of the ischium; upper border longitudinally grooved like ischium; outer ridge forming groove also very smooth.

The carpus is approximately parallel-margined, though finding its greatest width at about the distal end of the proximal three-sevenths; it is smooth and shining on inner and outer faces but finely denticulate on the upper margin for the greater part of its length, the denticles becoming obsolescent close to its posterior extremity; lower margin of carpus keeled, keel less conspicuous and more or less replaced by rather widely separated denticles or granules in anterior four-sevenths and also obscurely so at the hinder angle.

Palm, like carpus, smooth and shining on lateral faces, upper margin on inside very finely denticulate, lower keeled, keel smooth; on either side of keel there are tufts of long hairs, toward lower edge of palm the hair tufts are roughly alternate on either side of this keel; along the outer side of the keel from proximal end to tip of fixed finger there may be counted about eight tufts, on inner side eleven, the last five of which are more on the "ventral" surface of the finger, for here the keel seems to become less distinct anteriorly and the finger is a bit flattened below on the inner side of the palm; the keel of the lower margin is paralleled by a row of denticles for a little more than its distal half, denticles disappearing on the inner, lower margin of the finger where a blunt keel takes their place; the last hair tuft just below the extreme tip of the movable finger is elongate and more bushy than the other tufts.

The movable finger for the greater part is gently bowed, but at the far end is abruptly hooked; below, it is armed proximally with a

prominent blunt tooth, and anterior to it, with two blunt denticles; distally on the outer, upper border of the terminal hook of the movable finger there is a conspicuous blunt right-angled tooth topped with a thick tuft of hair. This upper, outer tooth on the movable finger makes the digit appear terminally bifurcate; the tooth seems to be a feature characteristic of this species alone; on the upper margin near the base of the tooth is a blunt tuberculiform tooth, and beginning a little distance behind this on the inner side of the upper margin of the finger, a row of low tubercles, about seven in the type; they seem not to be developed in smaller specimens; the fixed finger arises some distance—about half its length—behind the distal margin of the palm and forms with the forward projection of the palm a deep sinus; the fingers, when closed, have a large gape between them, half of which is formed by the sinus just described; the terminal portion of the movable finger closes or hooks outside the tip of the fixed finger.

The smaller cheliped, as compared to the larger, is slight and thin, carpus and propodus together being noticeably shorter than the carpus alone of the larger cheliped; the ischium is fairly straight, unarmed, thin, and flat, a little longer than the merus, shorter than the carpus, and a little shorter than the chela to the tips of the fingers when closed; from its hinder border the carpus narrows anteriorly in lateral aspect, likewise the hand to the tips of the fingers; measured to the tip of the extended movable finger, the hand and carpus are subequal; measured at the middle of its length, the width of the carpus is contained twice in the length of its upper border; the palm, measured from the base of the sinus between the fingers, is longer than wide and longer than the fixed finger measured from the same point, but equal to the movable finger; all joints of the cheliped are smooth and shining; merus and carpus hairy on lower margins, palm thickly so on both margins, fingers on outer surface face adjacent to prehensile edges provided with a thick felt or pad of hairs; prehensile edge of either finger denticulated, armed with about 15 small, sharp, triangular teeth, of which the most anterior are rather small; distal fourth of either prehensile edge or margin more or less without teeth.

The inner face of the ischium of the third maxilliped (pl. 3, fig. 2) shows a short crescentic row of tiny granulations, scarcely to be observed with a glass in a wet specimen; continuing the curve of the crescent formed by not over a dozen of these granulations is a slight ridge, set off by no more than an incised line beside it, which extends about three-fourths the length of the joint.

The abdomen is soft, broad, and depressed; the first two somites are dorsally thin and membranous, the others are thicker and tougher,

symmetrically grooved, and with the exception of the sixth, are ornamented on the epimeral region of either side with a pad or felt of hair.

The telson is about one and one-half times as wide as long, and a little less than half as long as the sixth abdominal somite; the telson and the sixth somite are ornamented with hair tufts about as in *C. major*, but otherwise the two are of very different shape. The telson of *C. islagrande* is truncate or more or less squared-off posteriorly, and but little contracted anteriorly; medially there is a longitudinal, smoothly rounded, raised area, but lower than the inflated lateral portions of the dorsum of the telson, which is bounded laterally by bowed-out, smooth grooves or depressions confluent behind but separating again to pass either side of a rounded, raised area, the pushed-up median portion of the hind border of the telson; the outer uropod is more or less triangular with but gently convex posterior margin, the inner uropod is narrow, tongue- or strap-shaped, distally rounded, and nearly four times as long as wide.

In the useful key given by de Man¹¹ our species would take place alongside of *C. major*, having, like it, very narrow inner uropods, about four times as long as broad, and, to use his expression, almost styliform. However, the different eyestalks, the remarkably elongate larger chela of the male, and the character of the telson sharply differentiate *C. islagrande* from that species.

The females need no separate description; their chelipeds are both much like the minor cheliped of the males.

Type.—U.S.N.M. no. 69362, the largest of 10 specimens (4♂, 6♀) collected by William W. Anderson at Grand Isle, La., in the summer of 1930. It is a male, measuring approximately (in millimeters): carapace 19 long, abdomen 62 exclusive of telson, telson 6 long by 8.5 wide. The larger right cheliped measures: ischium 21, merus 17, carpus 30 (greatest width 6.5), hand on upper margin 19. The extreme forward reach of the movable finger from the articulation to the summit of the tooth on the upper outer margin of the finger measures 10; from articulation to tip this finger measures only 8.5. The smaller, left cheliped measures: ischium 9; merus 8; carpus 11, width at middle 4.8; palm, upper margin 5, width at middle 3.5, lower margin to tip of fixed finger 7.3; movable finger from articulation to tip 6.

I have also seen a lot of 10 females collected by Dr. Ellinor H. Behre at the same place July 5-17, 1928, and a male taken July 15 of the same year by Mr. Anderson.

¹¹ Siboga-Exped. Monogr. 39a⁶, p. iii, 1928.

CALLIANASSA JAMAICENSE, n. sp.

Lineae thalassinicae present; central dorsal "oval" area bounded posteriorly by the cervical groove, and delimited before by a transverse groove behind the rostrum; cervical groove crosses the carapace two-sevenths of the length of the carapace from its hinder margin; the groove crossing the carapace behind the rostrum is about one-seventh the length of the carapace behind the tip of the rostrum; the rostrum extends beyond a line joining the barely marked, obsolescent lateral angles of the front by about half this distance. The rostrum is a stout conical spine reaching about as far forward as the distal margin of the cornea.

The eyestalks are contiguous throughout the extent of their inner margins; on the inner margin just in advance of the centrally placed cornea there is the suggestion of a tubercle reminiscent of the one described by Holmes¹⁵ for his *Lepidophthalmus*, now *Callianassa* (*Callichirus*) *eiseni* from Lower California, a species to which the present one shows kinship, yet from which it may readily be distinguished by the proportions and armature of the major cheliped. The eyestalks of *C. jamaicense* fall a little short of the first segment of the antennular peduncle; the second segment of the antennular peduncle is very little longer than the first measured from the orbital margin of the carapace, and a little short of a third of the length of the third segment; the terminal segment of the antennal peduncle reaches the middle of the last segment of the antennular peduncle, the fourth segment a little past the second of the antennular peduncle, and the second antennal segment and the first or basal antennular segment reach about equally far forward; the antennal scale is represented by a small, inconspicuous spine at the antero-lateral angle of the second segment; the first or basal segment reaches about to the middle of the cornea; as in all these *Callianassas*, the third segment of the antennal peduncle in dorsal view scarcely appears to be more than an articulation between the second and fourth segments of the normally five-segmented peduncle; the third segment is for the most part behind and hidden by the second segment.

The ischium of the larger right cheliped is nearly equal to the upper border of the palm in length and a little (about one-fifth) shorter than the merus; upper border of merus a little longer than that of carpus; merus about one and three-fourths times as long as its median width; carpus at middle of its length about as wide as length of upper border;

¹⁵ Proc. California Acad. Sci., ser. 3, Zool., vol. 3, no. 12, p. 311, pl. 35, figs. 6-13, 1904.

median width of palm and carpus equal; fixed finger measured from the sinus at its base is three-fourths the length of the palm measured back from the same point; it is fairly long and ends in a stout conical subacute tip, and a very low triangular tooth is situated about the middle of its length.

The movable finger is nearly a third longer than the fixed one and armed with three stout conical teeth, a blunt one near the base tending to fit into a notch at the upper end of the base of the sinus between the fingers; the second and larger of the other two more pointed teeth is placed just before the middle of the finger, and the third and smallest is located about one-third the distance from the second tooth to the tip; the upper border of the movable finger is smoothly rounded off, but toward the articulation is somewhat eroded-looking, two short grooves and several pits appearing here; there is a low, conical, inconspicuous tubercle, and perhaps a second lower one adjacent to it, just before the articulation; the fingers cross in such a way that the tip of the fixed one closes between the anterior of the three teeth of the movable finger and its hooked tip, and the two conical teeth of the upper finger bite just before the triangular tooth of the lower margin.

On the outer face of the palm, more or less continuing the line of the outer edge of the prehensile margin of the fixed finger back on to the palm, is a well-marked, curved carina extending back nearly half the length of the palm; above this carina is a low, depressed, triangular area; the anterior margin of the palm is armed with two blunt, forwardly directed teeth, one forming the outer side of the notch at the upper end of the base of the sinus between the fingers and the second placed laterally just below the articulation of the movable finger. Lower border of the palm and movable finger somewhat cristate and obscurely and bluntly serrate, rather, one might say, undulate, owing to the insertion of hair tufts found there; above the palm is more or less carinate in its posterior two-thirds. The carpus is cristate above and below, the anterior dorsal and ventral angles forming each a compressed triangular tooth.

All joints are smooth and shining. The merus shows a blunt longitudinal ridge on the outer face; the infero-proximal angle of this joint is armed with a conspicuous, angled lobe or toothlike process ending primarily in a stout, elongate, conical spine, on the inner hinder side of which is a secondary, smaller, and somewhat curved spine; the laminate lower margin of this joint is seven-toothed in its anterior two-thirds, the first two flattened, the second of these obscurely doubled, the following five placed on the anterior curve of the lower margin more tuberculiform, though compressed; the upper margin

of the merus is interrupted close to the posterior end by a conspicuous narrow U-shaped notch, at the upper extremities of which the dorsal margin of the joint forms a blunt tubercle.

The ventral margin of the ischium is, beginning near the hinder end, finely and for the greater part rather evenly denticulate, the denticles, however, gradually increasing in size anteriorly, the last two or three being larger, the last of these very large comparatively, and forming rather a tuberculiform tooth almost half a millimeter long and distally obscurely bilobed; in advance of this tooth the lower margin is blunt-ridged; above on the outer face, and shorter than the denticulated portion of the lower margin of the ischium, is an obscure, blunt ridge.

When both chelipeds are moderately extended to about the same degree, the fingers of the smaller reach scarcely half their length beyond the distal margin of the carpus of the larger. The ischium is about as long as the merus and a little longer than the carpus or upper margin of palm, but only four-sevenths the length of the movable finger. The upper margin of the dactylus is ridged and grooved, the prehensile edges of both fingers are wide and somewhat hollowed out and the movable one is furnished with two anteriorly converging lines of obscure, small tubercles; the extreme tips are somewhat abruptly constricted to form conical spinous tips so that there is apparently a blunt tooth at the anterior extremity of the outer moiety of each fairly broad prehensile edge; when closed, the tips of the finger reach about equally far forward; there is a sizable gape between them. The palm is rounded above, cristate below, except on the distal half of the fixed finger, carpus blunt above, cristate below, superior and inferior distal angles subacute, merus blunt-ridged above and below; ischium blunt above, with finely denticulate margin below; the ischium and merus are about of the same length measured on the upper border, either a little longer than the carpus, about one-third longer than the upper border of the palm, and a little less than two-thirds the length of the movable finger.

The inner face of the ischium of the third maxilliped (pl. 2, fig. 8) carries a smooth, blunt, yet well-formed, carina wholly without spinous armature, or tiny scalelike excrescences.

Telson somewhat rectangular, about one and one-third times as long as wide, little less than half as long as the sixth somite. Posterior margin three-lobed, shallow, median lobe occupying more than one-third of the posterior margin, and the gently curved lateral angles carried evenly and smoothly around to their respective sides to merge with lateral margins of the telson; dorsal surface evenly convex in both directions; across the dorsum of the telson a little way before the

base is a fine, sharply impressed line occupying more than half the total width of the telson. Inner uropod narrow, a shade more than twice as long as its greatest width measured on, and at right angles to, the median axis drawn from articulation to apex of the blade. Basal joint of uropod armed with a sharp, stout spine; there is a similar but even longer spine near the proximal end of the inner border of the outer uropod, forming with the blade a notch into which the outer margin of the inner blade snugly fits.

Holotype.—U.S.N.M. no. 69363, male, taken from a brackish pond at Montego Bay, Jamaica, by C. B. Wilson, June 29, 1910. It measures (in millimeters) approximately 73 long, tip of rostrum to end of telson; somewhat broken carapace about $18 \pm$, abdomen and telson 55, telson 6 long by 7.5 wide. Large chela, lower border of palm to tip of fixed finger 21, upper border 13.5, dactylus 12.5, width of palm at middle of length 12.5, upper border of carpus 12.5, width 12.5, upper border of merus 13.7, ischium 11. Small chela, lower border of palm to tip of fixed finger 16, upper border 6.1, dactylus 12.5, width 8.3, carpus 7.2 long, width at middle of length 6.3, length of merus 8, ischium 8.

A smaller specimen of about 61 mm in length, also from Montego Bay, taken on June 24 of the same year by Dr. E. A. Andrews, likewise from a salt-water pond, is like the type in all particulars, except in the ventral armature of the merus of the large cheliped, which is five-instead of seven-toothed toward the distal end of the joint. The fine, sharply impressed line across the midportion of the base of the telson is present, but does not extend as far to either side as in the type.

CALLIANASSA JAMAICENSE var. **LOUISIANENSIS**, n. var.

From Grand Isle, La., comes another specimen very similar to the preceding, which I should almost have been tempted to describe as a distinct species but for the fact that its larger right hand shows some evidence, though slight, of having been injured. For the present at least it had best be considered as no more than a varietal form. There is only a single male specimen taken by Chenier Ronaville, July 18, 1928.

Type.—U.S.N.M. no. 69364. The description of the type of the species proper as regards carapace, rostrum, and frontal appendages, about fits the variety; the eyestalks, however, have a very pronounced tubercle on the inner margin, whereas only a suggestion of one was to be seen in the type of the species. It was only mentioned in connection with the type, because a very definite though small tubercle is

visible in the only other specimen of the typical species at hand, also from Montego Bay, Jamaica.

The major right cheliped does not differ much from that in the typical species in the proportions of its joints and their armature except in the fingers; merus and carpus about subequal, measured on their upper borders; merus about twice as long as its median width; fixed finger from hind end of sinus between the fingers is one-half the length of the palm measured back from the same point. The fixed finger is short and strong and ends in a stout, conical, up-turned extremity and has a strong, blunt, tuberculiform tooth situated at about one-third the length of the finger from the back of the sinus between the fingers to the tip. The movable finger had the tip broken off before capture and may have lost from a tenth to a fifth of its length, the part remaining slightly exceeding in length the fixed finger. On the cutting edge it is provided with two teeth, a stout conical one near the base of the finger tending to fit into a notch at the upper end of the base of the sinus between the fingers, and an anterior longitudinally elongated laminate tooth; these teeth are so spaced that the tooth on the fixed finger bites between them, while the tip of the fixed finger closes in advance of the laminate tooth of the movable finger; on the upper margin of the movable finger is a single blunt tubercle, more conspicuous than either of the tubercles similarly placed in the type of the species; also in the variety the finger is smooth above and not eroded toward the articulation; in the second of the typical specimens the finger, again, is eroded and the tubercle inconspicuous.

Near the hinder end of the carina forming the posterior two-thirds of the upper border of the palm there is a brief emargination, followed by a small tooth; that this effect may have been brought about by an injury is possible; the conspicuous carina on the outer face of the palm of the type of the species is here represented by an inconspicuous impressed line perhaps two-sevenths the length of the palm in line behind it; no depressed area is evident above this line.

The antero-inferior angle of the carpus shows two tiny tuberculiform projections, one either side of a hair tuft at that angle.

The ventral margin of the merus, other than the two-spined lobe at the posterior end, as in the type of the species, is unarmed except for three compressed teeth near the anterior end of the middle third of the margin; the merus of the smaller of the two typical specimens closely resembles that of the varietal form, though it has five teeth in place of the three just mentioned. Posteriorly, the upper margin of the merus has a shallow emargination in place of the very definite notch found in the typical specimens. The tooth at the anterior end of

the denticulations arming the ventral margin of the ischium is larger than that in the type of the typical species, being nearly half a millimeter long.

The smaller cheliped is not much different from that of the type of the species proper, the fingers are more slender and the hand more triangular; the tip of the movable finger is also wanting.

The smooth, blunt ridge on the inner face of the ischium of the third maxilliped (pl. 2, fig. 7) appears unarmed or unadorned; only by careful inspection, and then with a glass, can five little scales or tiny, scarcely perceptible, well-separated, flattened spines be observed in line on the proximal third of the ridge.

Next to the differences from the typical specimens in the large chela and fingers, those found in the telson and the uropods are the most marked. The telson is even more rectangular-appearing than that of the type of the species, as the lateral angles are not so broadly rounded and the hinder margin is more truncate or straight; it is, however, like that type in being about one and one-third times as wide as long, and contained in the length of the sixth abdominal somite about twice; the telson is transversely evenly, though shallowly, convex, flatter than in the typical species, but unlike it, has the median longitudinal convexity interrupted by a not inconspicuous depression just before the hinder margin; the inner uropod measured as in the type of the species proper is but one and one-half times as long as wide; the basal segment of the uropods is armed with a low, blunt, triangular spine, and in place of the conspicuous spine on the proximal margin of the outer blade of the typical specimens there is an inconspicuous, low tubercle; no fine impressed line appears across the middorsal region of the telson parallel to and a little before the basal margin; there is a short, not at all well-marked, shallow, transverse depression on either side of the midline, but not crossing it; these two inconspicuous depressions are well separated from one another transversely and are in no way like the very definite fine line of either of the typical specimens, which very distinctly crosses the middorsal line of the telson.

The differences are such as one might expect, in part at least, between male and female specimens, but I can find no evidence that any of the specimens are female. True enough, the type retains but one basally much mutilated third leg, but there are in the other two specimens no traces of external female apertures, and the first pleopods of all three are of the same masculine character.

This varietal specimen measures (in millimeters) approximately 68 long, carapace and rostrum 16, abdomen and telson about 52; telson alone about 4.9 long by a shade over 6 wide. The large chela, measured

on lower border to tip of fixed finger, is 15.5 long; upper border of palm to articulation of dactylus 10, broken dactylus 7.7, width of palm at middle of length 11, length of upper border of carpus, as well as width, 11, upper border of merus 10.3, ischium 8.6. Small chela, movable finger 10, upper border of palm 4.3, width 6.5, lower border to tip of fixed finger 12, carpus 5.7, width at middle of its length the same, merus 6, ischium 6.5.

Remarks.—In giving a name to this proposed new variety, I am reminded of the varietal form that de Man¹⁶ has indicated for Borradaile's *C. (Callichirus) novae britanniae*, and again of his discussion¹⁷ of *C. (Tryphaea) californiensis* var. *japonica* Bouvier and *C. (T.) japonica* (Ortmann) and his *C. (Callichirus) longiventris* var. *borradailei*.¹⁸ I believe the specimen worthy of varietal designation until such time as additional material may call for a change of opinion.

CALLIANASSA (CALLICHIRUS) RATHEUNAE, n. sp.

With tridentate front and the "oval" area before the cervical groove scarcely delimited from the front, although a very faintly indicated groove crosses the anterior part of the carapace at a distance behind the orbital margin about equal to the length of the rostrum; laterally, this faint groove trends backward and downward toward the linea thalassinica on either side but does not join either it or the cervical groove behind. The cervical groove is deep and crosses the dorsum of the carapace about two-sevenths of the length of the carapace in advance of its hinder margin. The rostrum is a slender short spine reaching about one-half the length of the contiguous portions of the inner margin of the eyestalk. The latter are in contact for about two-thirds of their length, flaring in the anterior third widely outward to terminate each in a little pointed tubercle at the juncture of the inner border of the eyestalk and the gently incurved outer border in front of the cornea. This tubercle lies in line with the midpoint or center of the cornea and about the length of the corneal diameter in front of it. The corneae are light brown and occupy the outer two-fifths of the width of the stalk and approximately the fourth and fifth sevenths of the length of the stalk.

The eyestalks just overlap the distal margin of the basal segments of the antennular peduncle; thus the first segment of this peduncle is not visible except for a small portion either side of the eyestalks;

¹⁶ *Capita Zoologica*, vol. 2, pt. 6, p. 49, 1928.

¹⁷ *Idem*, pp. 18, 19.

¹⁸ *Idem*, p. 27.

the second segment of the peduncle is about four-sevenths the length of the first, and in turn three-fifths the length of the terminal segment. The second segment of the antennal peduncle on the right side reaches about as far forward as the basal segment of the antennular peduncle; the fourth segment reaches nearly to the distal margin of the terminal segment of the antennular peduncle; the terminal segments of both peduncles are nearly subequal in length and each about two-thirds the length of the fourth segment of the antennal peduncle; the antennal peduncle of the left side seems to be placed lower, as the distal margins of its several segments each fall short in turn of the forward distance attained by the segments of the extended peduncle on the right side. The lateral frontal spines are slender, sharp, incurved, and to some degree movable, as they are joined to the front by a somewhat flexible noncalcified extension of the carapace; they lie just without the line of the inner margin of the antennal peduncles. The lineae thalassinicae diverge more widely anteriorly than posteriorly, and so at the front the "oval" area which they appear laterally to limit seems much wider there than posteriorly, thus giving the dorsum of the carapace of this species an inverted wedge-shaped look unlike the other species described in this paper.

The large left cheliped has a very short carpus, which is a little short of being twice as high as long. Measured on the upper border, the palm is very slightly longer than the merus, and a very little shorter than the movable finger, about twice the length of the carpus and about one-fifth longer than the ischium; the palm is about as wide at its midpoint as the upper border is long. The ischium is armed beneath the anterior end with three moderately long, slender spines, toward the posterior end also with three more widely spaced, much smaller, slender ones, and at a point midway between the two groups there is a single spine of intermediate length; all of the spines are directed forward, as are those arming the lower border of the merus; on the latter are to be counted 12, which get smaller anteriorly, with the exception of the second spine, close by the first one, which seems smaller than it should be, perhaps abnormally so. The carpus and chela are smooth and shining; the upper and lower margins of the former are thin, laminate, and turned over to form a serrate edge above and below; in the case of the carpus for the greater part of the hinder margin this serrate edge is so turned over as not to be visible in the outer, lateral view of the cheliped, except for the most anterior two or three serrations at the infero-distal angle; the upper and lower margins of the palm are cristate and also serrate, but the serrations are not so much turned at right angles to the perpendicular as in the

carpus, for, although the dorsal serrations are scarcely visible from the side, the ventral ones are plainly so; the latter run forward only about half the length of the ventral border of the fixed finger. The prehensile edge of the dactylus has two elongate, not very prominent, laminate teeth, the fixed finger a single low triangular, more or less inconspicuous one a little behind the middle of its length. In the smaller chela the ischium is very little longer than the merus, subequal to the carpus, and nearly a third longer than the upper border of the palm; the movable finger is a little longer than the palm above. The greatest width of the carpus is contained about twice in its length, and equal in width to the palm; the width of the latter is contained in its upper border about one and one-third times.

On the inner surface of the ischium of the third maxilliped (pl. 3, fig. 1) there is a curved row of 17 teeth, of which the proximal 7 are strong, acute spines, and the remainder on the distal moiety of the comb are dentiform rather than spiniform.

Telson truncate, hinder margin slightly scalloped, a little less than one-half the length of the sixth somite and about four-fifths as long as its greatest width; inner uropod longer than the telson, but shorter than the outer uropod, broadly triangular; outer blades but weakly sculptured. Somites of the abdomen remarkably smooth and without ornamentation.

Type.—U.S.N.M. no. 23010, the larger of two male specimens in the collections of the National Museum, both from Bluefields, Jamaica, where they had been washed up after a storm in the summer of 1899. It measures (in millimeters): carapace and rostrum 18 long, abdomen and telson together 43, telson 5.3 by 6.7 wide; large cheliped, ischium 10 long, merus 11, carpus 6.5 long, greatest width 10.5, palm, upper border 12 long, movable finger 12, lower border 22.2, width of palm at middle of length 11. Small chela has the ischium 8.3 long, merus 7.7, carpus 9 by 4 wide, palm, upper border 6, movable finger 6.8, lower border, including fixed finger, 12.0, width of palm at middle of length 4.3

CALLIANASSA (CALLICHIRUS) LONGIVENTRIS A. M.-Edw.

Callianassa longiventris A. Milne-Edwards, Nouv. Arch. Mus. Mem., vol. 6, p. 92, 1870.

Callianassa (Callichirus) longiventris de Man, Capita Zoologica, vol. 2, pt. 6, p. 24, figs. 12, 12 h, 1928.

From the bathing beach at Montego Bay, Jamaica, Dr. E. A. Andrews, of Johns Hopkins University, took two specimens of a

Callianassa, one of which regrettably lacks the larger chelipeds, for both represent an exceedingly rare species known heretofore only from the type lot of four described in 1870 by A. Milne-Edwards, from Martinique.

A comparison with the detailed description given by de Man for one of the specimens of the type lot reveals certain small differences, mention of which might not be out of place here.

The rostrum is longer, extending about as far forward as the tubercles tipping the eyestalks; the acuminate, lateral spines of the front reach about as far forward as the corneae and so are longer, too, than those of the type.

I should say that the eyestalks are subcylindrical, though they appear in dorsal view to be more or less cylindrical; the corneae are rounded, bulged-up prominences on the anterior dorsal surface of the transversely convex stalks; the patches of dark pigment are concentrated within in the median, posterior halves of the corneae.

The first and third segment of the antennular peduncle are about subequal, each a little longer than the second segment. The terminal segment of the antennular peduncle exceeds the corresponding segment of the antennular peduncle by about three-fourths its length; the fourth or penultimate segment reaches about two-thirds the length of the second segment of the antennular peduncle; while the distal dorsal margin of the third, which is about all that is visible of it from above, about attains the distal margin of the basal segment of the antennular peduncle.

The telson is rather angulated, posterior margin rather straight with the triangular median prominence well marked; medially, in the anterior half above, there is a small, smooth and shining, more or less semicircular raised area from which the telson falls away to its margins; two obscure ridges run back to the postero-lateral angles of the telson; on the posterior margin just inside either of these angles is a tuft of long hair; the hinder margin of the raised area on the dorsum of the telson is also furnished with a pair of these hair tufts.

The larger cheliped, as in the type described by de Man, is also on the left side; of the ventral ischial spines, the last is the larger, and so it seems to be also in the drawing that de Man gives of this joint; on the lower border of the merus there are but three instead of four spines, the first the smallest, the third larger and more forwardly directed than the others; these three, moreover, are all placed close

together at the infero-posterior angle of the joint and not so placed as to occupy the greater portion of the ventral margin as shown in the picture of the variety figured by Borradaile¹⁹ and referred to by de Man. Measurements (in millimeters) are as follows: carpus on the upper border 6 long and 8 broad at the distal margin; palm 11.5 on the upper margin, 9 broad at the middle, and 17.5 on the ventral margin to the tip of the fixed finger; movable finger from articulation to tip 9 long. The distal border of the palm is distinctly crenulate and, as in the type, is separated by a minute triangular incision from a low triangular tooth which, in the case of our specimen, has its apex at about a fourth of the length of the cutting edge of the finger from the small triangular notch at the base to the tip; the cutting edges of both fingers are sharply cristate throughout, biting so as to about impinge on the "crown" of the tooth of the fixed finger; there is a low, not very conspicuous, triangular tooth on the movable finger.

In the smaller cheliped, the ischium is armed below with 10 instead of 7 spines; the merus has a spine as in the type; it is here placed on the inferior margin at the end of the first third, but, unlike the type, shows a second spine midway between it and the infero-posterior angle of the merus; of this spine the distal half has been broken off, apparently before capture. Measurements (in millimeters) are as follows: carpus 6 long and 5.7 wide at the distal end; upper border of the palm 7 long, the lower to the tip of the fixed finger 14, width at middle 6; the distal margin of the palm is crenulate, but not so distinctly so as in the larger chela, the fingers are armed much as are those of the larger hand; the movable finger is about 8.8 long.

The comb on the inner surface of the ischium of the third maxilliped (pl. 3, fig. 3) is armed, in the distal half with 12 to 15 small sharp spinuliform teeth, followed in its proximal portion by three large, strong, rather widely separated spines.

Of this more complete specimen, a male, the carapace and rostrum together are about 20.7 long, the abdomen and telson together approximately 63; telson is about 6.2 wide at base by 5.8 long. The specimen without chelipeds is a female, a little larger in size, measuring not less than 88 from tip of rostrum to end of the telson.

¹⁹ The fauna and geography of the Maldive and Laccadive Archipelagoes, vol. 2, pt. 3, p. 752, pl. 58, fig. 2, 2b, 1904.

CALLIANASSA (CALLICHIRUS) ACANTHOCHIRUS STIMPSON

Glypturus acanthochirus Stimpson, Proc. Chicago Acad. Sci., vol. 1, p. 46, 1866; Ann. Lyc. Nat. Hist. New York, vol. 10, p. 121, 1871; de Man, Siboga-Exped., monogr. 39a⁶, p. 19, 25, 180, 1928.

De Man has already intimated that *Glypturus* as a genus is perhaps not distinct from *Callianassa*. His point is well taken, for any examination of the subgenus *Callichirus* will show a number of species that have third maxillipeds approaching, if they do not actually possess, the *Glypturus* type of external maxilliped. The generic character given by Stimpson and based on these appendages, "ischium armed along the middle of its inner [face, instead of edge as Stimpson has it—surely a slip of the pen] with a sharp, prominent, spinous crest," is common to the majority of the species of *Callianassa*; as are the "deeply sculptured caudal lamellae," to a number of the representatives of the subgenus *Callichirus*. Little needs otherwise to be said of this well-characterized and easily recognizable species. The opportunity is here taken (pls. 1-4) of supplying some photographic details of a male specimen of the species. On the distal half of the inner face of the ischium of the third maxilliped (pl. 3, fig. 4) is a comb of 10 spinous teeth of irregular size, but roughly, more or less alternately large and small; near the proximal margin of the joint and continuing the line of the comb are four large and one much smaller dentiform tubercles.

EXPLANATION OF PLATES

PLATE 1

- FIG. 1. *Callianassa jamaicense*, ♂, carapace and frontal appendages, \times about $2\frac{1}{2}$.
 2. *C. jamaicense* var. *louisianensis*, ♂, same.
 3. *C. islagrande*, ♂, same.
 4. *C. longiventris*, ♂, same.
 5. *C. rathbunae*, ♂, same.
 6. *C. acanthochirus*, ♂, same.

PLATE 2

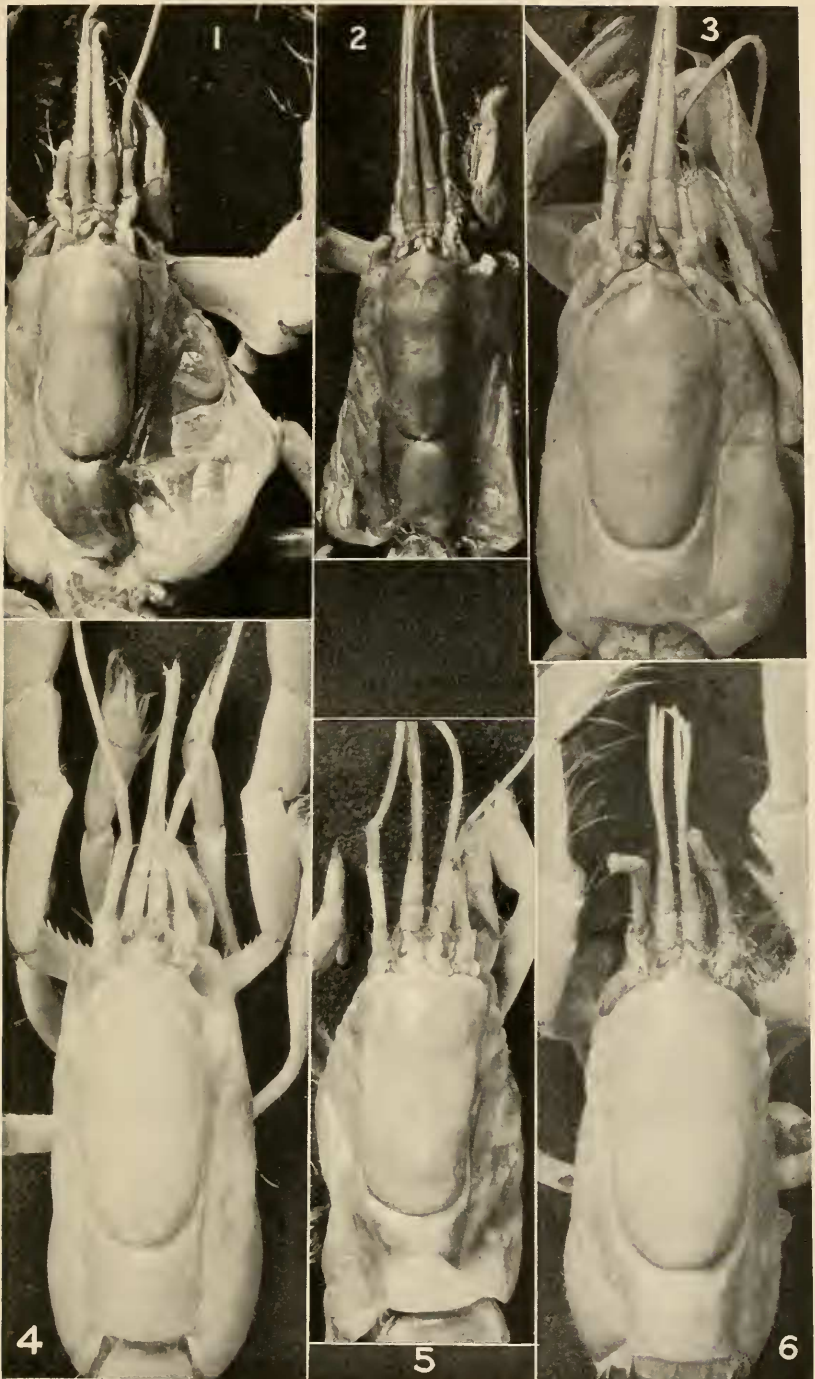
- FIG. 1. *Callianassa islagrande*, ♂, chelipeds, \times $\frac{4}{3}$.
 2. *C. rathbunae*, ♂, same.
 3. *C. longiventris*, ♂, same.
 4. *C. jamaicense* var. *louisianensis*, ♂, same.
 5. *C. acanthochirus*, ♂, same.
 6. *C. jamaicense*, ♂, same.
 7. *C. jamaicense* var. *louisianensis*, ♂. *a, d*, inner and outer faces of third maxilliped; *b, c*, inner and outer aspects of third leg, \times about $2\frac{1}{2}$.
 8. *C. jamaicense*, ♂. *a, d*, inner and outer faces of third maxilliped; *b, c*, inner and outer aspects of third leg, \times about $2\frac{1}{2}$.

PLATE 3

- FIG. 1. *Callianassa rathbunae*, ♂. *a, d*, outer and inner aspects of third leg; *b, c*, outer and inner faces of third maxilliped, \times about $2\frac{1}{4}$.
2. *C. islagrande*, ♂. *a, d*, inner and outer faces of third maxilliped; *b, c*, inner and outer aspects of third leg, \times about $2\frac{1}{4}$.
3. *C. longiventris*, ♂. *a, d*, inner and outer faces of third maxilliped; *b, c*, inner and outer aspects of third leg, \times about $2\frac{1}{4}$.
4. *C. acanthochirus*, ♂. *a, d*, inner and outer faces of third maxilliped; *b, c*, inner and outer aspects of third leg, \times about $2\frac{1}{4}$.

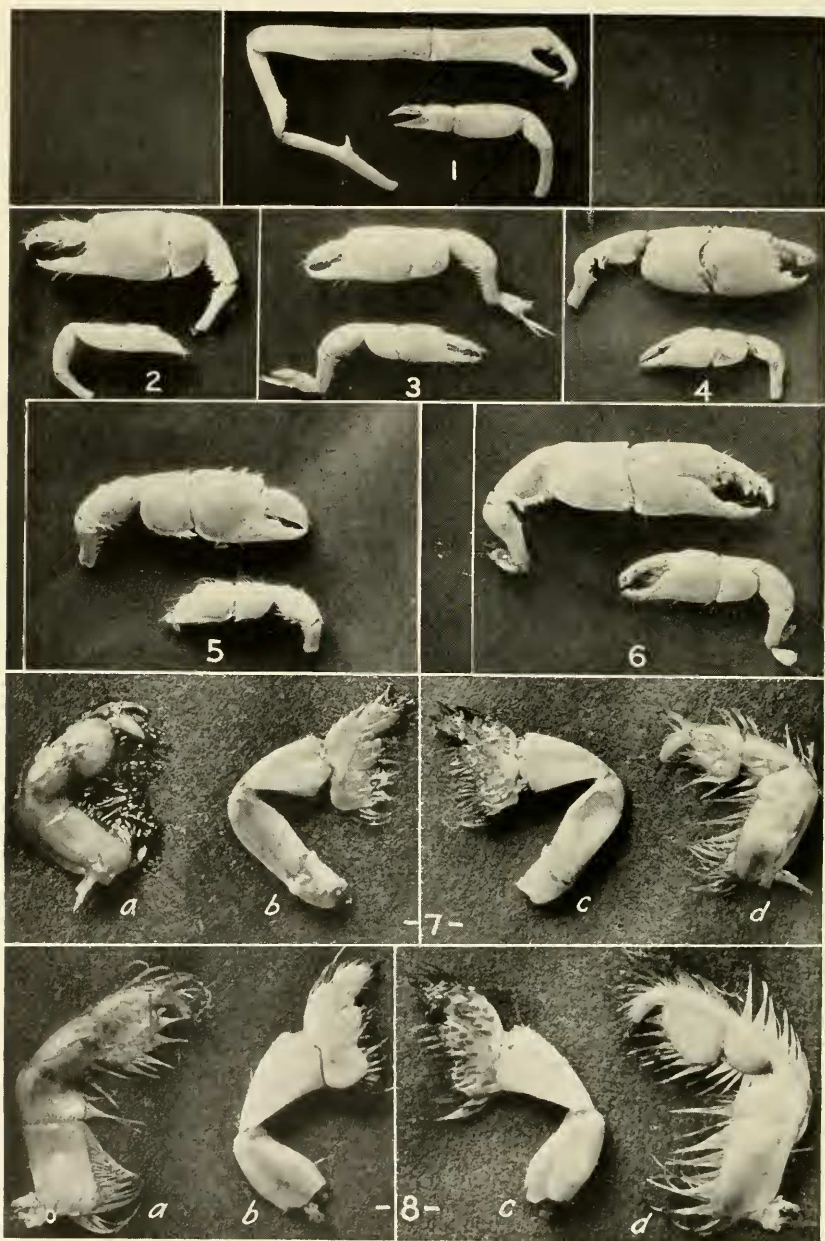
PLATE 4

- FIG. 1. *Callianassa jamaicensis*, ♂, telson, dorsal view \times about $2\frac{1}{4}$.
2. *C. rathbunae*, ♂, same.
3. *C. longiventris*, ♂, same.
4. *C. jamaicensis* var. *louisianensis*, ♂, same.
5. *C. islagrande*, ♂, same.
6. *C. acanthochirus*, ♂, same.

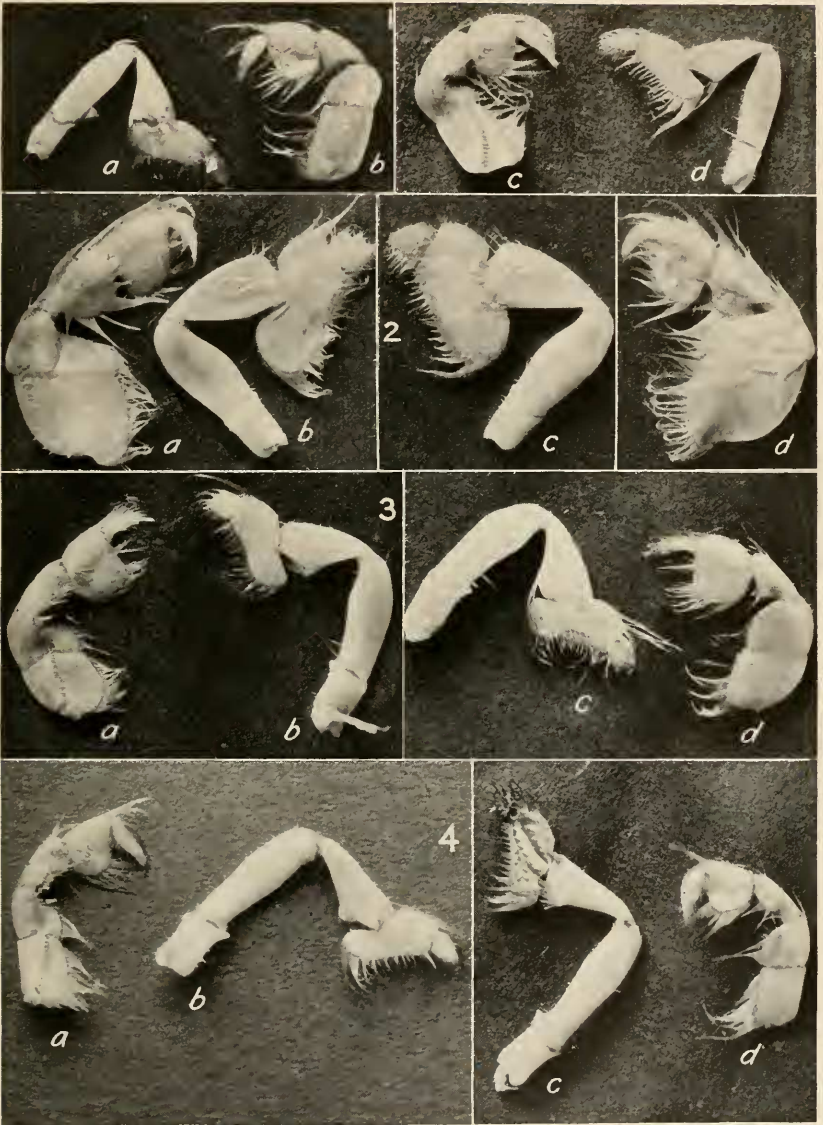


MUD SHRIMPS OF THE GENUS *CALLIANASSA*

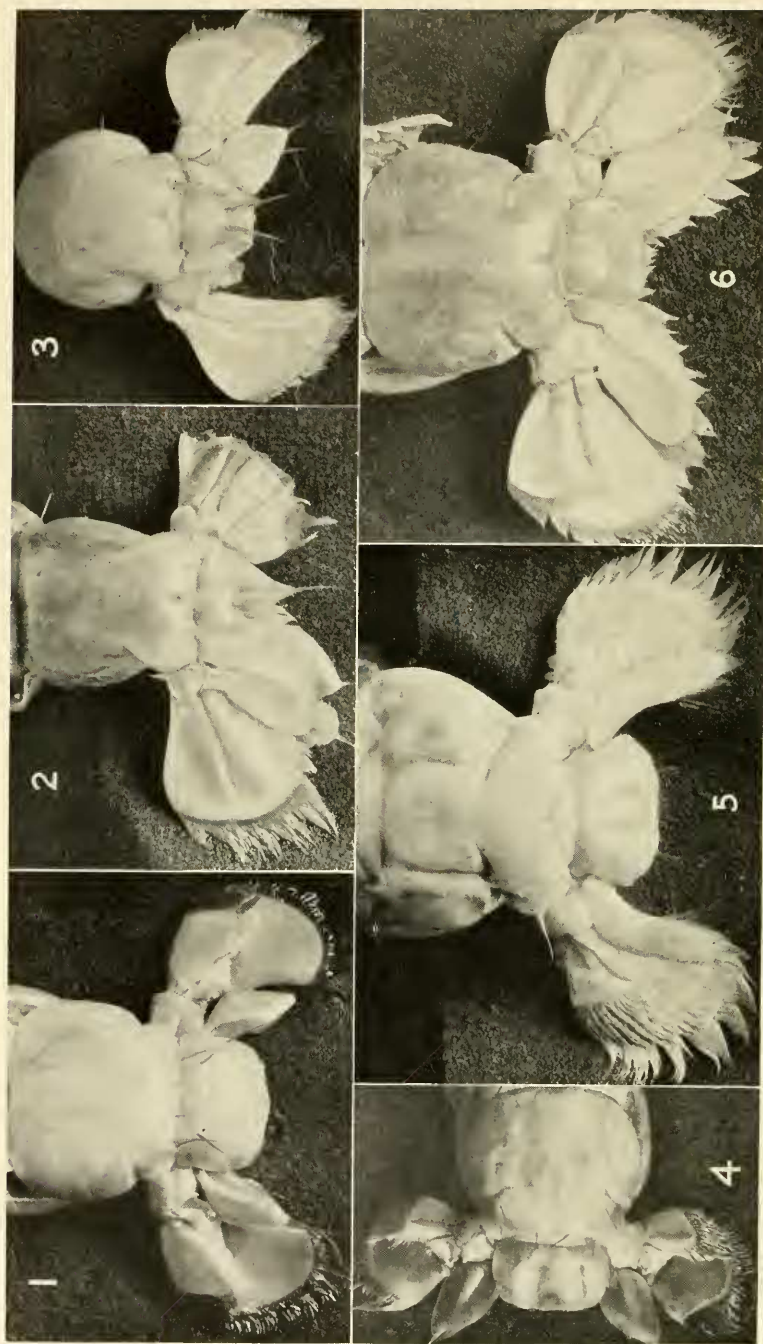
(For explanation, see page 20.)



MUD SHRIMPS OF THE GENUS *CALLINANASSA*
(For explanation, see page 20.)



MUD SHRIMPS OF THE GENUS *CALLIANASSA*
(For explanation, see page 21.)



MUD SHRIMPS OF THE GENUS *CALLIANASSA*

(For explanation, see page 21.)